



## GREETINGS

The first issue of the Extension Poultry Husbandman greets you. It has been created to circulate among the poultry specialists. No hatching dates have been set, for the size and frequency of this publication will depend much on the contributions of the poultry specialists.

Last, in order to get better acquainted, a list of the specialists is printed at the end of this publication. We hope all the recent changes are included although with the rapidly shifting personnel it is a very difficult matter to keep up to date. You can help by letting us know when changes are made.

Speaking of changes, can anybody write a prize-winning paragraph on why poultry specialists change so frequently? Here are the statistical data for your paragraph: Six per cent of the poultry specialists have been in their States ten years or over, 27 per cent have served five to ten years, but 67 per cent stayed on the job five years or less. Now the next issue should have plenty of copy from old-timers in the 6 per cent class and certainly some from the 67 per cent majority.

This house-organ type of publication is going to depend greatly on contributions. If you have an especially effective piece of work don't fail to send us an account of it.

Address all communications to:  
H. L. Shrader,  
Bureau of Animal Industry,  
Washington, D. C.





The "Old Grocer" of the Chicago Tribune staff has given us this bit of philosophy; "No merchandise is ever sold. Only ideas are sold and the merchandise with them." With the extension specialist selling ideas to directors, county agents, cooperators and farmers it is always a good plan for him to examine his merchandise occasionally. Thus, plans of work or projects fill up his sample case. Of what do they consist? Are they job lots, a miscellaneous accumulation of plans inherited from his predecessor, or a well-arranged instrument that is shaped with care and thought and fits snugly into some apparent need. Project plans may not always reflect the quality of extension work actually accomplished but they do show the ability of the specialist to think through his problems and organize his selling campaign. We expect more effective merchandising from the well-arranged sample case than the miscellaneous pack carried by the tramp peddler.

Reuben Brigham of the extension staff in Washington, who stands six feet plus tall and from that elevation is used to looking several miles ahead, has given us four milestones which can be followed to advantage in drawing up our plans of work.

- |              |             |
|--------------|-------------|
| 1. SIMPLIFY  | 3. LOCALIZE |
| 2. VISUALIZE | 4. ORGANIZE |

#### DEMONSTRATION FARM FLOCK RECORDS

At the 1928 meeting of the Poultry Science Association a demonstration farm flock record committee report was submitted and adopted. At that time most of the record blanks for the year had been printed, but it is hoped that the items mentioned in the resolution will be incorporated in all new report forms.

The resolution is as follows:

WHEREAS, a large number of States have incorporated demonstration and calendar record flocks in their poultry extension program, and considering that a special committee and the poultry specialists from ten different States conferred on the detailed problems in record keeping.

WHEREAS, much confusion has arisen in the use of different systems of reporting.





BE IT RESOLVED that the Poultry Science Association recommend that as far as possible and practical the poultry extension workers concerned adopt the following suggestions on monthly and annual summary reports.

For calendar flocks the monthly summary list the following items: Number of farms; number of birds; eggs per bird; per cent mortality.

For demonstration flocks the same as calendar flocks with the following additions: Egg income per hen; total income per hen; feed cost per hen; net selling price per dozen eggs; feed cost per dozen eggs.

On all record-keeping flocks, all birds on the farm to be used in the reports.

The size of flock classification to be divided into three groups: Less than 100, 100 to 500, over 500.

To calculate average number of eggs per bird divide total eggs produced each month by total birds on the farm the first day of the month. To obtain yearly flock average add these 12 monthly figures together. When a yearly State flock average is issued use only flocks that send in 12 reports.

In demonstration flock reports where the feed cost of the growing stock is not reported as a separate item, mention must be made to that effect.

Eggs produced by pullets before November first should not be credited to the total eggs produced by the farm flock, unless the pullets are listed in the total number of birds on the farm the first of the month.

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#### MORE ABOUT DEMONSTRATION FLOCKS NEXT TIME

The next issue will contain some data from the monthly demonstration flock reports. Please look up your mailing list and see that we are receiving those reports.

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#### GROW HEALTHY CHICKS

The interest in Grow-Healthy-Chick campaigns is very widespread. The results from several of the States are being reproduced not only for their statistical value but to show the type of data that can be collected from well-organized projects. We hope the next issue will contain a contribution showing how such data can be utilized most effectively.





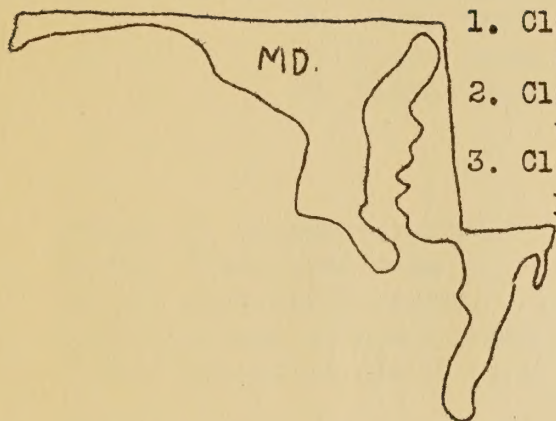


# THE "GROW HEALTHY CHICKS" CAMPAIGN IN VARIOUS STATES

## Plans and 1928 Results

### Maryland

#### Plan



1. Clean chicks - Start with good chicks from healthy stock.
2. Clean brooder house - Sweep, scrape, scrub, disinfect, whitewash.
3. Clean ground - Move house to ground entirely free of poultry and manure for at least a year.
4. Clean litter - Use clean straw or shavings. Clean often, at least every 5 days.
5. Clean feed - Mash, grain, greens, milk. Feed in boxes, trays, or other clean dry places.
6. Clean management - Avoid carrying infection from hens to chicks. Clean shoes and keep out visitors.
7. Separate sexes by ten weeks - Avoid crowding; fatten and market cockerels early.
8. Keep mortality and feed cost records until pullets are housed. Records measure success.

#### 1928 Results

Practices	;Farms;Chicks brooded;Chicks lost at 10 weeks			
	: No.:	Number	: Number	: Per cent
Followed all practices.....	3	1,593	98	6.1
Followed all except "clean chicks"..	11	11,772	1,590	13.5
Followed all except "clean ground"..	2	545	57	10.4
Followed all except "clean chicks," "clean ground".....	13	15,580	2,414	15.4
Did not follow three or more prac- tices.....	16	11,176	2,441	21.8
Total.....	45	40,358	6,139	15.2







## D e l a w a r e

### Plan

1. Clean chicks.
2. Clean incubators and eggs.
3. Clean brooder houses.
4. Clean ground.
5. Clean litter.
6. Clean feed.
7. Clean management.
8. Clean laying houses.

### 1928 Results

Number of chicks enrolled .....	143,513		
Number died first week.....	10,855	-	7.50% loss
Number died first month.....	15,864	-	11.05% loss
Number raised on new ground.....	44,771	-	8.90% loss
Number raised on old ground.....	98,713	-	12.20% loss

<u>Points followed</u>	<u>Chicks</u>	<u>Loss</u>
7	12,522	3.50%
6	31,101	8.70%
5	39,691	13.00%
4 or less	34,182	17.90%

## N e w J e r s e y



### Plan

#### Campaign: Wage War on Worms and Disease

1. Hatch or buy chicks early.
2. Keep brooder house clean.
3. Provide clean range or close confinement.
4. Keep old and young stock separate.
5. Build screen manure pit.
6. Wire dropping boards.
7. Clean dropping board daily.





## 1928 Results

Number of cooperators signed up.....	1,481
Number of chicks represented.....	2,136,725
Reports received.....	344
Reports used in summary.....	230
Chicks used in summary.....	299,291
Average mortality.....	18.6%
Number of cockerels removed.....	124,615
Number of cull pullets sold.....	10,990
Number of good pullets housed.....	107,983
Good pullets per 1,000 chicks brooded.....	360
Number of chicks where all 7 points were followed.....	23,009
Mortality where all 7 points were followed.....	14.2%
Number of chicks where points 5, 6 or 7 were not followed.....	98,922
Mortality where points 5, 6 or 7 were not followed.....	17.2%
Number of chicks where points 2, 3 or 4 were not followed.....	177,504
Mortality where points 2, 3 or 4 were not followed.....	20.0%

## New Hampshire

### Plan

Campaign: Grow Healthy Pullets

1. Clean chicks.
2. Clean houses.
3. Clean land.
4. Clean litter.
5. Clean feed.
6. Clean management.



## 1928 Results

Number of chicks signed up.....	1,009,160	
Number of chicks reported.....	354,338	
Number following all 6 points.....	74,367-	6.0% loss
Number following all points but No. 1.....	43,974-	12.0% "
Number following all but points No. 1 and 3.....	14,591-	16.5% "
B.W.D. Accredited chicks.....	171,094-	6.0% "
Nonaccredited chicks.....	183,244-	15.2% "
Lost <u>all</u> causes.....		12.89% "





# R h o d e I s l a n d



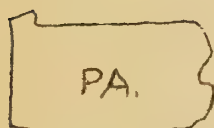
## Plan

1. Clean chicks.
2. Clean incubators.
3. Clean brooder houses.
4. Clean ground.
5. Clean litter.
6. Clean feed.
7. Clean management.
8. Clean laying houses.

## 1928 Results

263 enrolled  
 122 with 123,045 chicks reported  
 12 " 8,773 " had no loss by disease  
 70 " 96,193 " from tested stock  
 52 " 36,852 " from nontested stock - mortality 26%  
 33 followed all 8 points with 26,963 chicks - " 9%  
 118 used clean litter  
 113 cleaned and disinfected houses before chicks arrived  
 Average mortality of all flocks - 17.4%

# P e n n s y l v a n i a



## Plan

1. Clean chicks.
2. Clean houses.
3. Clean litter
4. Clean feed.
5. Clean management.
6. Clean range (or confinement).
7. Clean laying house.

## 1928 Results

Number of cooperators.....1,515  
 9 farms - 12,000 chicks  
 Under complete confinement..... 9.33%  
 Total chicks started and pullets placed in house.....38.50%  
 Mortality: 1 to 4 weeks..... 9.18%  
           4 to 8 " ..... 3.13%  
           8 to 12 " ..... 1.32%  
           12 to 16 " ..... .67%  
           16 to 20 " ..... .40%  
           20 to 24 " ..... .18%  
 All periods.....14.83%





C o n n e c t i c u t

Plan



1. Clean chicks.
2. Clean incubators and eggs.
3. Clean brooder houses.
4. Clean ground.
5. Clean litter.
6. Clean feed in hoppers.
7. Clean management.
8. Clean laying houses.

Results for 1926 - 1928\*

	<u>1926</u>	<u>1927</u>	<u>1928</u>
Number of chicks signed up to be grown according to the G.H.C.P.	1,038,637	1,073,751	1,226,608
Number of chicks reported with summary	502,938	552,882	701,202
I			
Number of chicks where all 8 points were followed (chicks free from B.W.D.)	219,314	257,279	304,401
Total disease mortality	7.9%	6.9%	6.3%
II			
Number of chicks where 8 points were followed except chicks free from B.W.D.	115,036	103,750	144,800
Total disease mortality	15.3%	14.4%	13.3%
III			
Number of chicks where 8 points were followed except clean land	-----	73,028	137,217
Total disease mortality	-----	13.9%	12.5%
IV			
Number of chicks where 8 points were followed except clean chicks and clean land	101,013	118,825	114,784
Total disease mortality	22.0%	18.9%	14.6%
V			
Number of chicks where minor details were not followed	67,575	-----	-----
Total disease mortality	15.0%	-----	-----
Losses due to dogs, cats, foxes, skunks, rats, hawks, crows and owls	1.9%	1.7%	1.7%
Losses due to theft	.1%	.2%	.09%
Losses due to accident	1.1%	1.1%	1.2%
Losses due to cannibalism	---	.9%	1.1%
Chicks unaccounted for	.6%	1.6%	1.2%
TOTAL LOSSES - NOT DISEASE	3.8%	5.5%	5.3%
TOTAL LOSSES - DUE TO DISEASE	13.4%	11.6%	10.3%
TOTAL LOSSES - HATCHING TO MATURITY	17.2%	17.1%	15.6%
Average egg production in the Connecticut Home Egg-Laying Contest for 6 years previous to the Connecticut Grow Healthy Chicks Campaign - 142.07			
EGG PRODUCTION SINCE GROW HEALTHY CHICK CAMPAIGN	143.93	153.88	161.45

\* Figures cover from hatching dates to maturity.



I l l i n o i s

Plan

Project Reported on: Poultry Sanitation



1. All mature fowls to be confined to a limited range area on the double yarding system, and not allowed to run with other stock.
2. All mature fowls to be tested for avian tuberculosis and bacillary white diarrhea by a competent local veterinarian and reactors removed under his supervision at the owner's expense.
3. All breeding fowls to be allowed outdoors in direct sunlight on all fair days during the winter months.
4. All poultry houses to be equipped with concrete or board floors, and in case of cement or board floor being impossible, agricultural limestone.
5. All houses to be thoroughly cleaned and disinfected regularly.
6. All houses to provide from  $3\frac{1}{2}$  to 4 square feet of floor space per bird.
7. All houses to provide ample openings for proper ventilation.
8. All houses to be equipped with horizontal dropping boards.
9. All young chicks to be grown on clean grass range over which no chickens of any age were allowed to run the previous season.

Summary of 1928 Results with Chicks on 188 Farms

	<u>Total number of chicks</u>	<u>Per cent mortality</u>
Kept on clean ground	88,820	21.4
Kept on old ground	20,878	42.4
Kept on partly clean ground	16,387	31.7
From B. W. D. tested flocks and kept on clean ground	26,540	19.0
From B. W. D. tested flocks and kept on old ground	<u>10,221</u> 162,846	46.8





O h i o

Plan



Project Reported on: Grow Healthy Pullets

1. Clean chicks.
2. Clean houses.
3. Clean land.
4. Clean litter.
5. Clean feed.
6. Clean management.

1927 and 1928 Results

	Year	Number of flocks	Chicks started	Per cent left 2 weeks	Per cent left 10 weeks
All chicks.....	1928	470	246,782	90.4	81.4
" " .....	1927	224	128,737	89.6	81.0
Leghorns.....	1928	257	161,359	92.5	85.4
" .....	1927	123	83,157	92.0	82.0
Rocks .....	1928	77	28,870	90.4	79.2
" .....	1927	36	14,917	88.8	75.0
Reds .....	1928	51	17,420	82.8	71.4
" .....	1927	22	10,353	84.5	65.0
Wyandottes.....	1928	26	11,151	78.5	66.4
" .....	1927	14	6,538	84.0	70.3
Other breeds.....	1928	59	27,983	84.5	69.5
" " .....	1927	29	15,100	91.0	79.0
Received milk.....	1928	386	206,983	90.8	81.6
" " .....	1927	197	116,419	90.9	80.5
No milk.....	1928	84	39,799	88.6	78.0
" " .....	1927	18	12,302	83.6	67.0
Coal brooder.....	1928	337	181,913	90.6	81.2
" " .....	1927	179	101,433	94.7	79.6
Oil brooder.....	1928	65	26,729	89.6	79.7
" " .....	1927	27	19,649	86.7	75.0
Gas brooder.....	1928	21	9,384	88.7	79.6
" " .....	1927	9	5,927	92.5	82.8





1927 and 1928 Results in Ohio (continued)

	Year	Number of flocks	Chicks started	Per cent left 2 weeks	Per cent left 10 weeks
Straw litter.....	1928	153	86,577	91.5	82.9
" " .....	1927	88	60,234	92.0	82.6
Chaff litter.....	1928	147	68,784	88.8	79.2
" " .....	1927	37	16,053	88.0	79.5
Sand litter.....	1928	29	13,920	86.8	73.2
" " .....	1927	23	11,049	87.0	77.0
Peat mess litter.....	1928	36	28,925	92.6	83.3
" " " .....	1927	16	12,126	82.0	69.0
Shavings litter.....	1928	22	11,155	92.6	82.6
" " .....	1927	12	5,999	94.0	86.0
Ohio all-mash.....	1928	134	76,166	91.0	82.7
" " .....	1927	127	74,444	90.6	80.3
Commercial mash.....	1928	159	84,303	91.2	81.0
" " .....	1927	40	24,905	79.0	69.0
Brooder moved.....	1928	274	148,123	90.7	81.7
" " .....	1927	132	80,462	88.9	78.3
Brooder not moved.....	1928	196	98,659	90.0	79.9
" " " .....	1927	92	49,540	91.0	78.5
Chicks reared separate...	1928	398	212,998	90.8	81.6
" " " ...	1927	193	112,371	90.0	90.5
Chicks not separate.....	1928	72	33,784	87.8	77.4
" " " .....	1927	31	17,794	88.0	74.7

W a s h i n g t o n

Plan

Project Reported on: Grow Healthy Chicks



Number of farms cooperating..... 1,039  
 Number of chicks brooded.....498,637  
 Pullets raised to 3 months per  
 1,000 chicks ..... 444



S o u t h   D a k o t a

Plan



1. Clean ground.
2. Clean brooder house.
3. Clean chicks.
4. Clean feed.
5. Time of hatching.

1927 Results

Chicks Raised in Brooder House

	<u>Number of chicks reported</u>	<u>Per cent mortality to August 1</u>
Followed none of the practices	185	54.1
"    1    "    "    5 practices	1,659	54.6
"    2    "    "    5    "	11,466	38.8
"    3    "    "    5    "	35,046	30.5
"    4    "    "    5    "	38,383	24.9
"    all 5 practices	<u>12,777</u>	<u>22.7</u>
Total and average	99,516	28.7

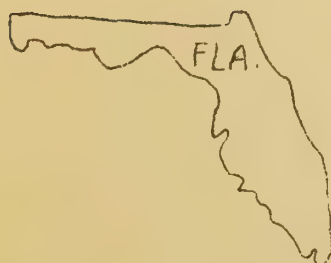
Chicks Raised with Hens

Followed none of the practices	2,394	40.39
"    1    "    "    4 practices	7,055	33.30
"    2    "    "    4    "	12,486	31.60
"    3 or 4 of the 4 practices	<u>6,263</u>	<u>21.10</u>
Total and average	28,198	30.40

Data from 350 flocks.

F l o r i d a

Plan



1. Hatch early.
2. Clean chicks and eggs.
3. Clean brooder houses.
4. Clean land.
5. Balanced ration.
6. Separation of pullets and cockerels.





## Florida (Continued)

### 1928 Results

35 farms with 29,573 chicks, 24.26% loss      6 farms fed home mix  
 24 farms fed milk, 14 liquid and 10 dry      27 hatched before May 1  
 29 farms fed commercial feed      5 hatched before and after May 1  
                                          3 hatched after May 1

### Weekly Data on 33 Farms

<u>Weeks</u>	<u>Accident</u>	<u>Disease</u>	<u>Total</u>
1	3.62%	3.90%	7.52%
2	.20	3.90	4.10
3	.12	2.82	2.94
4	.12	2.34	2.46
5	.09	1.16	1.25
6	.05	.57	.62
7	.02	.48	.50
8	.01	.48	.49
	<u>4.23%</u>	<u>15.65%</u>	<u>19.88%</u>

## M i s s o u r i

### Plan



1. Hatch before May 1.
2. Raise on clean fresh range.
3. Feed a growing ration.
4. Brood each hatch separately.
5. Separate pullets and cockerels.
6. Maintain clean sanitary quarters.

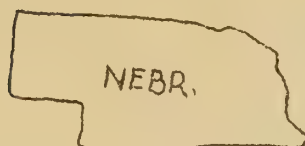
### 1928 Results

On 351 farms, with 161,856 chicks, the mortality for first six weeks was 10.2 per cent.

	<u>G.H.C. Plan</u>	<u>Ordinary Methods</u>
Number of hens.....	354	241
Eggs per hen.....	165	147
Income over feed cost per hen....	\$2.66	\$1.86







N e b r a s k a

Grow Healthy Chicks Score Card

	<u>Points</u>	<u>Score</u>
1. Early hatching Heavy breeds in March. Light breeds in April. Deduct 2 points for each week later than these months	15	
2. Fresh ground Free of old or young chickens for two years if not cultivated; one year if cultivated	15	
3. Completeness of ration Providing - Animal protein, mineral, starch, green feed, sunshine or codliver oil - (two points each)	10	
4. Separate broods and separate range Different ages of chicks separated from each other during brooding period and from the old flock at all times	10	
5. Sanitary conditions Allow five points for each of the following: 1. Drainage, 2. Filth-proof feeders, 3. Filth-proof waterers, 4. Clean brooder house, litter, and yards	20	
6. Equipment Allow three points for each of the following: 1. Movable brooder house, 2. At least one square foot of floor space for every three chicks, 3. Good venti- lation, 4. Affords ample protection and retains the heat, 5. Is well lighted and allows direct sunshine to enter, 6. Is equipped with sun parlor, 7. Brooder with chimney for removing fumes, 8. Feeders that per- mit half the chicks to eat at once, 9. Waterers that permit one third of the chicks to drink at once.	27	
7. Records A complete record showing fertility, hatchability, date of hatches, livability, kind, amount, and value of fuel and feed	3	

Name \_\_\_\_\_

Address \_\_\_\_\_ County \_\_\_\_\_

Variety \_\_\_\_\_ Date \_\_\_\_\_



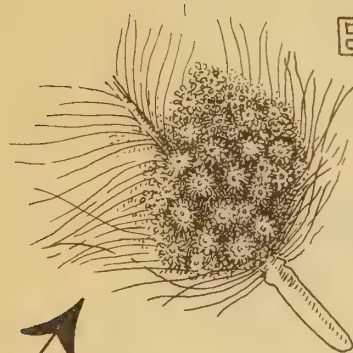


#### LIFE CYCLE CHARTS AVAILABLE

In cooperation with the Zoological Division, of the Bureau of Animal Industry, and the Division of Insects Affecting Man and Animals, of the Bureau of Entomology, four charts have been prepared showing the life cycles of chicken lice, mites, tapeworms, and cecum worms. Copies of these charts are attached to this publication. Should any of the specialists desire extra copies of these prints, particularly to use in connection with 4-H club demonstration teams, an adequate supply is on hand. Please address your request to H. L. Shrader, Bureau of Animal Industry, Washington, D. C.



# LIFE OF CHICKEN LICE



EGGS

attached to  
feather. Hatched by  
heat of hen in about  
a week

become adult in 10 to 20 days



HEAD LOUSE

BODY  
LOUSE

LICE feed  
on skin or feathers  
of fowl

SODIUM FLUORIDE  
EXTERMINATES  
ALL LICE

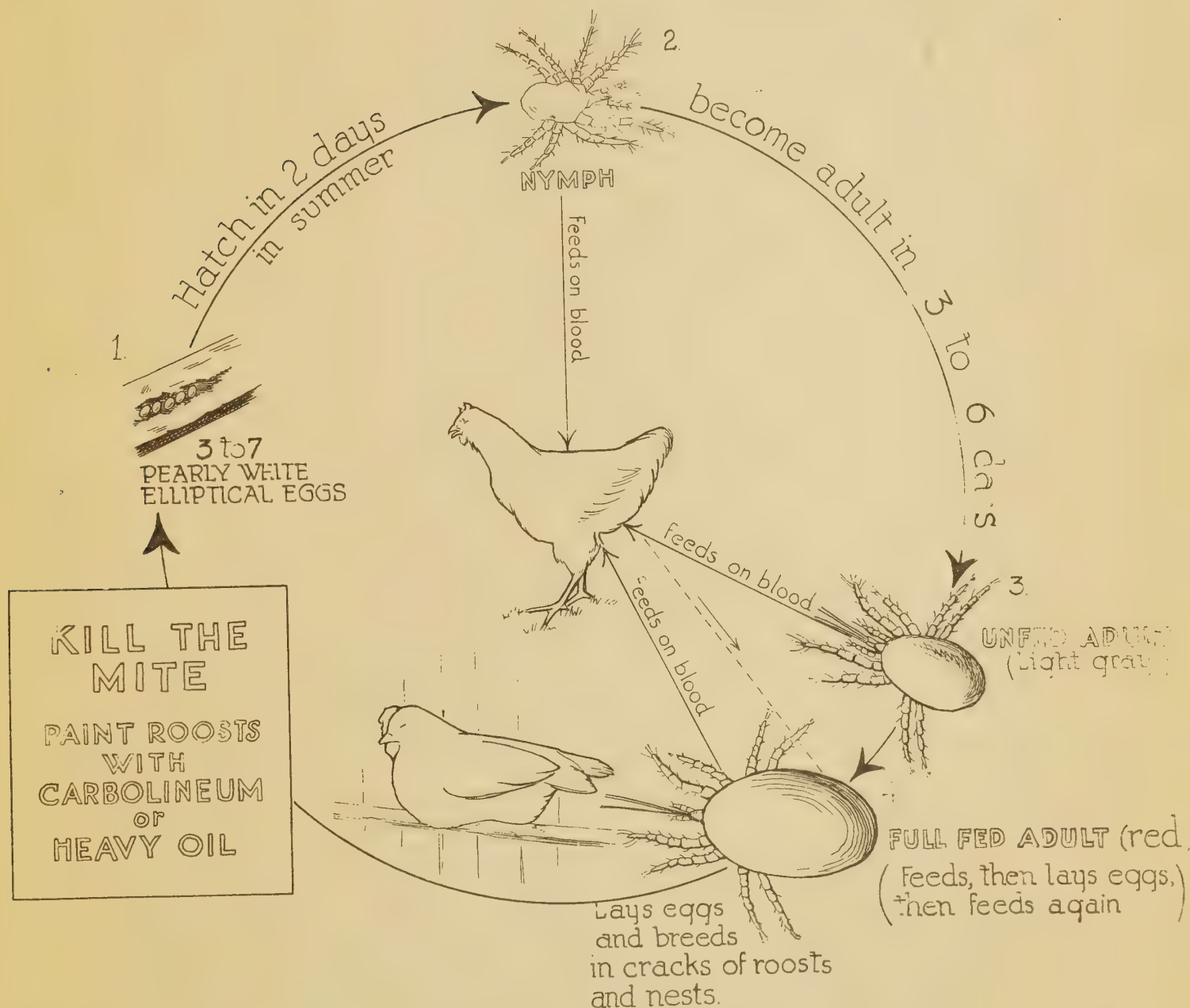
DUST or DIP FOWLS

Lays eggs on feathers





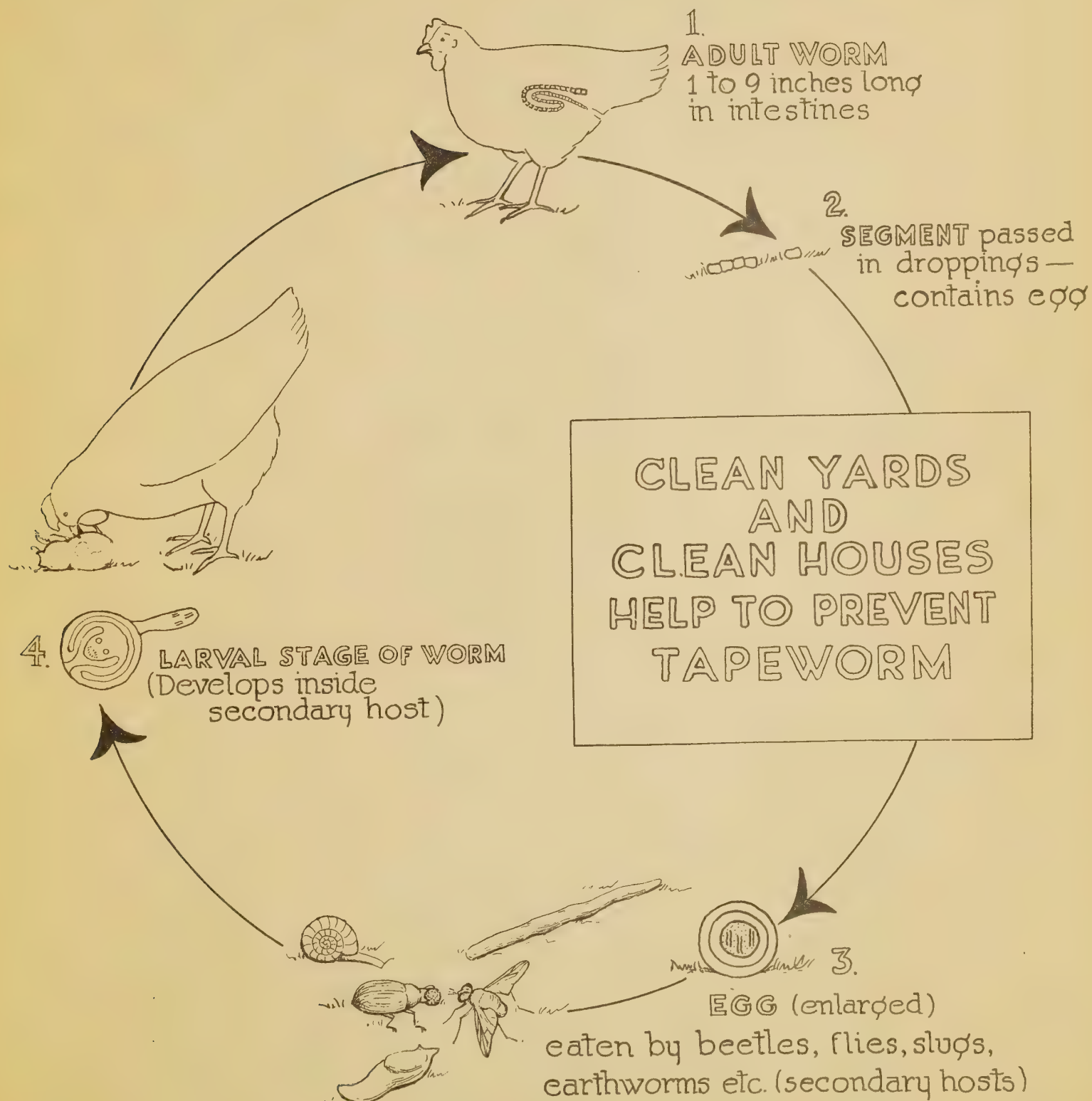
# LIFE OF COMMON CHICKEN MITE





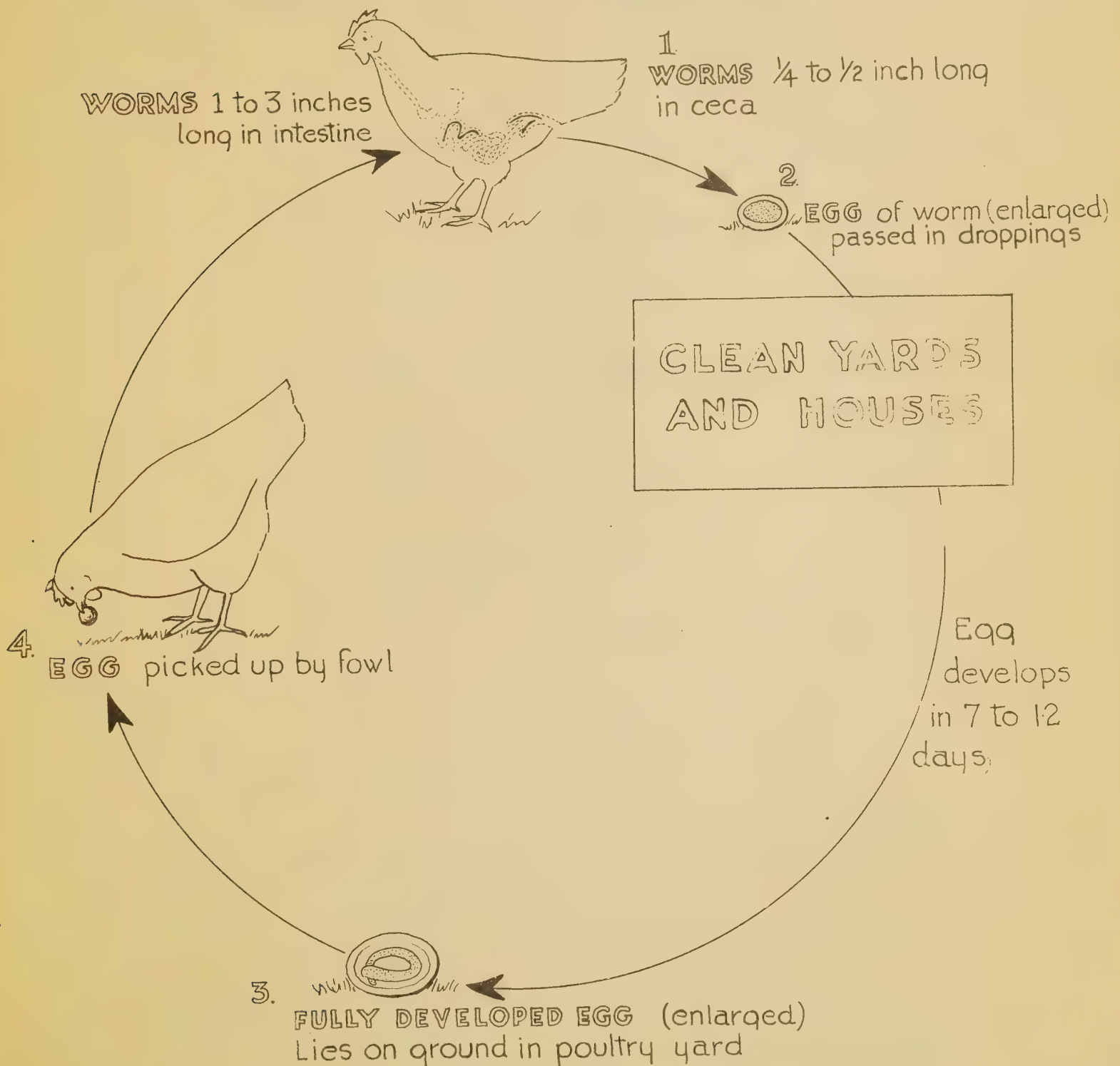


# LIFE OF POULTRY TAPEWORM





# LIFE OF LARGE ROUND WORM AND OF CECUM WORM OF POULTRY







EXTENSION SPECIALISTS IN POULTRY

STATE	NAME	HEADQUARTERS
Alabama	G. A. Trollope	Alabama Polytechnic Institute, Auburn, Alabama.
Arizona	Clyde F. Rowe	College of Agriculture, University of Arizona, Tucson, Ariz.
Arkansas	G. W. Knox	College of Agriculture, University of Arkansas, Fayetteville, Ark.
California	W. E. Newlon	College of Agriculture, University of California, Berkeley, Calif.
Colorado	O. C. Ufford	College of Agriculture, University of Colorado, Ft. Collins, Colo.
Connecticut	R. E. Jones E. S. Walford	Connecticut Agricultural College, Storrs, Conn.
Delaware	Hoke S. Palmer	University of Delaware, Newark, Del.
Florida	N. R. Mehrhof	Experiment Station, Gainesville, Fla.
Georgia	J. H. Wood R. J. Richardson W. P. Clarke	Georgia State College of Agriculture, Athens, Ga.
Idaho	Pren Moore	Extension Division of the University of Idaho, Boise, Idaho.
Illinois	H. H. Alp	University of Illinois, Urbana, Ill.
Indiana	L. C. Todd Wm. Kohlmeier S. R. Walford	Purdue University, La Fayette, Ind.
Iowa	W. M. Vernon W. R. Whitfield W. D. Termohlen	Iowa State College of Agriculture, Ames, Iowa.
Kansas	G. T. Klein M. A. Seaton	Kansas State Agricultural College, Manhattan, Kans.
Kentucky	C. E. Harris J. E. Humphrey	College of Agriculture, University of Kentucky, Lexington, Ky.



STATE	NAME	HEADQUARTERS
Louisiana	Clydo Ingram C. L. Hill	Louisiana State University, Baton Rouge, La.
Maine	H. L. Richardson	College of Agriculture, University of Maine, Orono, Me.
Maryland	W. H. Rice	University of Maryland, College Park, Maryland.
Massachusetts	Wm. C. Monahan	Massachusetts Agricultural College, Amherst, Mass.
Michigan	J. A. Hannah E. R. Hancock O. E. Shear Leo Arnold - -	Michigan State College, East Lansing, Michigan. Marquette, Mich. (Court House)
Minnesota	Miss Cora Cooke F. B. Hutt	University of Minnesota, St. Paul, Minn.
Mississippi	J. D. Sykes Miss Eva Legett	Mississippi A. & M. College, A. & M. College, Miss.
Missouri	Berley Winton Harold Canfield	College of Agriculture, University of Missouri, Columbia, Mo.
Montana	Miss Harriette E. Cushman	State College of Agriculture, Bozeman, Mont.
Nebraska	J. R. Redditt J. H. Claybaugh	College of Agriculture, University of Nebraska, Lincoln, Nebr.
Nevada	Verner E. Scott ( $\frac{1}{2}$ time)	College of Agriculture, University of Nevada, Reno, Nev.
New Hampshire	F. L. McGettigan	University of New Hampshire, Durham, N. H.
New Jersey	L. M. Black J. C. Taylor	State University of New Jersey, New Brunswick, N. J.
New Mexico	E. E. Anderson ( $\frac{1}{2}$ time)	College of Agriculture, State College, N. Mex.
New York	L. M. Hurd L. E. Weaver R. C. Ogle	New York State College at Cornell University, Ithaca, N.Y.







STATE	NAME	HEADQUARTERS
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Rhode Island	C. P. Hart	Rhode Island State College, Kingston, R. I.
South Carolina	C. L. Morgan P. H. Gooding Miss Juanita Noely--	Clemson Agricultural College, Clemson College, S. C. State Normal College, Rock Hill, S.C.
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West Virginia	R. L. Mason	College of Agriculture, West Virginia University, Morgantown, W. Va.
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